521 M7280 – SATELLITE GEODESY

SPRING SEMESTER 2017

Lab No. 5

handed out Wednesday, March 29, 2017
due Wednesday, April 12, 2017, 09:10 **Name:** _____

GREENWICH SIDEREAL TIME vs. QUASI-INERTIAL FRAME

1. Write a Matlab program that computes the Greenwich Sidereal Time (GST) (sampling at every 10 minutes) for a three-day period. Use the GST value on your birthday as the initial value.

   a. List your results in a table from, which should contain 7 columns: time (0 to 3*24*60 minutes for every 10 minutes; GST (^{o}, ‘, ”); GST (hour, min, sec). The output significant digit should be equivalent to 0.0001 second.
   b. Plot the GST values in a map. Mark the GST values at the start of each day with a different symbol.
   c. Check the accuracy of your program using the provided table.

2. Convert the ECEF coordinates of one point that you generated in the previous assignment to the coordinates in quasi-inertial frame during a one-day period.

   a. List your results in a table with 9 columns: GST (hour, min, sec), x, y, z, X, Y, Z.
   b. Plot the point’s position in two 3-D maps (one for quasi-inertial and the other for ECEF frames).

3. Discuss extensively the required significant digit (1a), the behavior of GST (1b), and the behaviors of the point in the quasi-inertial and ECEF frames (2a & 2b).

Use for $\boldsymbol{GM} = 398600.4418\left(\mathrm{km}^3/\mathrm{s}^2\right)$, $\omega_e^* = 7292115.8553\times10^{-11}\left(\mathrm{rad/s}\right)$, $\omega_e = 7292115\times10^{-11}\left(\mathrm{rad/s}\right)$, and $\boldsymbol{R} = 6371.000000\left(\mathrm{km}\right)$.

Your (individual) final report should contain (use A4 papers):

- this page as the cover sheet
- source code(s) and outputs; do not forget to add your name and lots of comment cards to the source listing (% .....)
- input and output files from program [input/output values used and calculated], if any
- plots, including captions on axes, title, your name, LB#/HM#, course title, date (if any)
- derivation and description of formulas used, accompanied by figures where applicable
- evidence of computational accuracy
- discussion of results